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THE JOURNAL OF PHILOSOPHY

THE NEED OF A NEW ENGLISH WORD TO EXPRESS RELATION IN LIVING NATURE

PART I

I

NATURAL bodies stand in different kinds of relation to one another. This is so obvious that it can not escape the notice of anybody. Indeed, the fact of its being before the face and eyes of every person all the time largely accounts for its so seldom getting reflective attention. That a telegraph pole set in the ground is differently related to the earth from what a growing tree is; that the relation between the crystals in a granite boulder are different from that between, say, a lichen growing on it and a hammer which may have been laid on it by a workman; and that a lady's finger is differently related to her hand from what her finger ring is to the finger on which she wears it, are all such commonplace facts that for ordinary purposes they neither get nor need special attention.

But the time comes, if one is bent upon knowing the world through and through, and of making the most possible of it, when these cursorily noticed different kinds of relation have to be closely examined.

Many different English words are used to designate relation between bodies: coordination, correlation, union, cooperation, conjunction, combination, interaction, interdependence, are some of the more common of these. And some aspects of the idea about what relation is have received great attention. For example, not many subjects have held a more important place in speculative philosophy. The subjectivistic idealism that has so dominated modern philosophy down to a few years ago has conceived relation to pertain fundamentally to the domain of judgment, the entire world being conceived as belonging to this domain. To present the argument advanced in support of this conception "would almost be," says J. M. Baldwin, "to write the history of metaphysical logic since the time of Kant."

But even in the logic and theory of knowledge now necessitated from recognizing the inadequacy of the Kantian system, relation has a prominent place. Says John Dewey, "relation is, directly or indirectly, the central thing in knowledge." Similarly, L. E. Hicks, the author of "Normal Logic or the Science of Order," writes: "It is questionable whether any sort of mental activity whatever can be

mentioned which does not involve relations'' (this JOURNAL, July 15, 1920). And another writer, A. E. Avey (''The Present-Day Conceptions of Logic,'' *Phil. Rev.*, XXVIII, 4, p. 405), has defined logic as the science of relations.

It is a noteworthy and, it seems to me, highly significant fact, that although all the sciences into which the mind enters as subject matter have given much attention to the general problem of relation, and although the physical and biological sciences are so largely occupied with particular relations among the objects of nature, these latter sciences have considered but little the general or common nature of the various relations with which they deal.

From this standpoint, the great prominence into which one aspect of relation in physical nature, that, namely, known as relativity, has recently come, is peculiarly interesting.

The present study is concerned primarily with an aspect of relation in organic nature that is coming to be widely referred to under the term integration. I have used the term myself quite extensively, especially in *The Unity of the Organism.*

But experience and reflection, largely since *The Unity* was published, have led me to recognize that the word is used by different workers in different portions of that realm, with meanings or at least with implications that are sometimes strongly at variance with one another and rarely, if ever, with full justice to the phenomena to which they are applied. Because of these defects I have become impressed with the importance of subjecting the phenomena to careful examination with a view to a better understanding of them, and to a better way of utilizing and expressing them.

I shall specify one of the clearest, most important of these discrepancies in the use of the word integration.

The lexicon definitions of integration often contain the idea that disintegration is its antithesis or opposite. ''Integration is the act of bringing or process of bringing together as parts of a whole, disintegration the act or process of separation into component parts.'' (*Dict. of Phil. and Psychol.*) Sometimes this idea is expressed inferentially rather than explicitly. Thus restoration or renewal are not infrequently given as definitive of integration, the clear implication being that destruction or disintegration had previously taken place.

It is not my purpose, of course, to contend that this meaning for integration is incorrect when a comprehensive definition of the word is being sought.

The point I would make is that when understood in this sense it is not only inadequate but is very misleading as frequently applied to living beings. For example, the assimilation of food by an organ-

ism is manifestly not a process of integration in the sense of restoring the tissues and organs by recombining the parts of the organism which had previously existed in a separated or disintegrated condition. Organic assimilation consists not only in bringing the food particles into connection with the organism's tissues and organs, but of transforming the particles from what they were *as food* into other particles now existing *as tissues and organs* of an organism, though it may be counted as integration when viewed as a process which opposes or counteracts disintegration.

Clearly, then, when we are dealing with some of the most distinctive of the relating and combining phenomena of living beings, if we apply the term integration to them it is greatly important that we recognize the necessity of giving it a meaning the opposite of which does not imply disintegration or destruction. Indeed, so important has it seemed to me latterly that relation in living beings of the sort now in mind be kept more clearly in view that I have given considerable time to searching for a word that would better express such relation than does integration.

The circumstance that *differentiation* is used to express the coming into existence of new parts—tissues, organs, *etc.*—in individual development, has been useful in this search. Hardly any word is more prominent in the general vocabulary of organic development than is this, and there is almost no ambiguity as to its meaning. But so obvious is it that such development consists not only in the coming on of new parts, but as well in the establishment of proper relations among them, that to-day no competent student would define individual development, or ontogeny, without bringing into the definition reference to the relating as well as to the producing of parts. And when a single word is used as the correlate of differentiation that word is very apt to be integration. Now the word integration has grown, as one readily sees, from another root than that from which differentiation takes its origin.

The Latin *gradior* upon which integration is founded has no other implication, it appears, than that of moving step by step as in walking, while *ferre,* the root part of differentiation, had as one of its original meanings, so the Latin lexicons inform us, that of bearing in the sense of producing, even to the producing of offspring by parents. This last meaning of the word gives it special fitness as a biological term, so vitally distinctive of life is production by birth and growth. To-day no phenomenon of living beings is regarded as adequately dealt with until it has been tried by the established principles of organic genesis. Manifestly, then, differentiation comes closer home, so to speak, as a name of developmental processes than

does integration. This being so, what we really need to express the relating aspect of development is a word which contains the *ferre* root of differentiation, as well as a prefix expressing the antithesis of the *dif* of differentiation. Now the prefix which most commends itself for this is *con*. But unfortunately the English language recognizes no combination of a derivative from *ferre* with the prefix *con*, which is homologous with differentiate. Conference presents the combination of course. But in common usage this has a very different meaning from a true antithesis of differentiate as a term of organic development. A conference between two or more persons is an incidental, even though planned meeting of these for a special purpose, and always implies their separation when the purpose for which they met has been accomplished. This is manifestly very different from the togetherness of the parts of an organism. A complete separation of such parts, as the members of a conference separate, means the death of one and all; whereas it means not even so much as an injury to the separated participants in a conference.

Conferentiate, the obvious developmental antithesis of *differentiate*, does not occur in any dictionary I have been able to consult. Yet this word with its derivatives seems to be exactly what the science of organic development needs to express the relational aspect of the process. Ontogeny could then be succinctly and concisely characterized as the *process of differentiation and conferentiation of the individual organism*. The clear implication would be that whatever the conditions and forces which bring into existence new parts of the organism, conditions and forces exactly corresponding to these, though in a sense opposite in character, must be operative in all development that is biologically organic. It would be a great misfortune were the word integration to get a secure place in the popular language of organic science, always having the implication that its antithesis is disintegration. But there is some danger of just this happening as I am convinced from several things which I have recently seen and heard.

The difference between integration and conferentiation may be still more sharply expressed by saying that integration is essentially a preservative, while conferentiation is not only preservative but is also constructive and progressive. The assimilation of food by the tissues is integrative, though, as previously pointed out, not conferentiative. This illustration is apt enough so far as concerns assimilation in a *full grown* organism. When, however, a *growing* organism is considered, one may ask whether assimilation is then integrative or conferentiative. The answer is that even assimilation during growth is fundamentally different from the process for which the term con-

ferentiation is suggested. For one thing this difference is seen in the fact that assimilation results in the *complete transformation* of the food material into the growing tissue, organ, etc.; whereas the conferentiative process never results in the complete transformation or loss of identity of either of the interacting bodies. There is a reciprocality of action and effect in conferentiation that is absent in assimilation.

The coining of words I look upon as justifiable only under very urgent demands. But it appears to me the situation here indicated constitutes such a demand. I have, consequently, decided to use the word *conferentiate* and its derivatives, conferentiation, conferentiated, *etc.*

II

With these reflections as a base of operations, we may now proceed to examine in some detail the group of relational phenomena, the generalized name for which I am proposing the new word *conferentiation.*

The examination will be facilitated by noticing at the outset the limits within which the relation between organic bodies results in recognizable influence upon each other of the bodies concerned. Those limits obviously are, for one thing, the slightest recognizable influence at one extreme, and the greatest at the other.

Attending first to the side of minimum influence, let us take some instance in which the relation between two organic bodies has as little influence upon them both as any we know. Consider, for example, a banana plant in Hawaii and an Esquimau in Labrador. That these stand in *some sort* of relation to each other, no person who thinks carefully will question for a moment. That both may be visited by one and the same traveler and described in terms familiar to great numbers of persons using the same language as that used by the traveler, surely constitutes a kind of relation. But yet—and this is the main point in this example—the relation here is so remote that its influence upon the two organisms as they now exist and have existed during their entire lives is practically nil. It is negligible, as we say. Probably no one could discover that either would have been in the slightest degree different from what it is had the other never existed. The working naturalist who deals in any way with either one will be justified in wholly ignoring, so far as his actual investigation is concerned, the possibility that the other may have influenced the one he is studying.

Nevertheless, as a thoroughgoing naturalist, he can not wholly ignore such possibility. For instance, what about the law of univer-

sal gravitation? If, as this law says, every particle of matter in the universe attracts every other particle, then surely the Labradorian Esquimau can not escape the gravitational influence of the Hawaiian banana plant; and vice versa. What the practical naturalist does and does perfectly justifiably, is to *assume* that the present status of his science, botany or anthropology, as the case may be, does not require him, indeed does not permit him, to pay any attention to the gravitational relations between these two bodies.

Such reflections give an important cue for procedure in carrying out the proposed examination. This cue indicates that it will be advantageous to go to inanimate nature for criteria of relational influence within animate nature. This is so partly because organic science has not yet any such exact tests of the influence exerted by living bodies upon one another when they are far apart, as inorganic science has through its knowledge of, for example, that influence known as gravitation. This knowledge, as all educated persons know, puts into the hands of scientists tests of the gravitational influence of bodies, both animate and inanimate, upon one another which are readily applicable at any time, and are easily statable in both qualitative and quantitative language.

Notice now what comes to light when such tests are applied to the gravitational influence of, say, the heavenly bodies upon one another. It is one of the commonest of commonplaces of natural knowledge since Newton, that the whole state of nature, both earthly and heavenly, is dependent upon this influence—that the "*state* of nature" is an "*order* of nature" just because of it.

So profound, indeed, is the influence that we can not picture, even in imagination, with any degree of clearness what the state of nature would be were the influence to cease. It almost seems as though without it nature itself could not exist. So here is a kind of relation in which the related bodies though far apart, many of them enormously far apart, yet influence one another very profoundly, at least so far as their "movements in space," as we say, are concerned.

But does the influence stop with its effect upon the movement of the bodies in space? Certainly not. The ocean tides come forward as an unimpeachable witness to the great influence upon a portion at least of the structure of one body, the earth, due to its relation with other distant bodies of comparable size. And here we come upon another striking result of applying the tests for relational influence now possessed by science: not the ocean merely—the portion of the earth which at present is most susceptible of being moved somewhat independently of the rest—but all its parts, no matter how solid, are also moved with a slight degree of independence of the

rest, by this same relational influence. The earth tides, in other words, now being detected and measured, bear witness to a slight measure of independent movement of all parts of the earth under the relational influence called gravitation. The entire earth body suffers deformation to a minute extent from its gravitational relation with moon, sun, and, in theory at least, all other heavenly bodies. *This deformation may be looked upon as the price which the earth pays in terms of its individuality for being held and guided in its individual career within the general order of nature.*

But here comes a point of major significance for the study we are making: although the tides of the earth constitute something of an impairment, so to speak, of its bodily form and structure, this is not enough to constitute a real injury to it or even to obscure its identifiability in the least. Although ordinary geography must, and does, take notice of ocean tides, especially along certain coasts where the rise and fall and flow of water are excessive owing to peculiar land conformations, no one thinks of the contemporaneous earth as anything else than itself, because of, or even as essentially altered by, the tidal movements of either its fluid or solid constitutents. So is it, I say, with the earth of the present era. As to the effects of such movements through geologic and astronomic time, that is quite another matter, but one which this very general examination of natural relation does not require us to notice further.

So much by way of illustration of relational influence upon natural bodies where such influence, though fundamentally determinative of the very existence of the bodies, yet affects their individuality to only a slight extent—to an extent so slight as not to constitute any impairment of their identifiability.

Now let us turn to an example of the opposite extreme of relational influence. And here again inanimate nature furnishes the most striking and best known examples. They come from that kind of relation between bodies known as chemical.

An instance which well exemplifies the principles involved is familiarly at hand in the "chemical" relation between the two bodies (more frequently called substances in such cases), sodium and chlorine. As is known to every one who has done any practical work in elementary chemistry, sodium is a white metal having a silvery luster. At ordinary temperatures it has the consistency of wax, but at 20° below zero, Centigrade, it is quite hard and very ductile. It melts at about 95°, appearing then as a liquid resembling mercury, and at 742° it boils and vaporizes, the vapor having a "peculiar purple color" when seen in quantity by transmitted light. Under proper conditions it takes on the crystalline form, the

crystals belonging to the quadratic axial system, their shape being acute octohedral. It is slightly lighter than water so that it floats when thrown on cold water, but then undergoes rapid dissolution.

The other body, chlorine, is a gas at ordinary temperature and pressure, but with a little lowering of either temperature or pressure or both combined, it becomes a yellow liquid, having a specific gravity of 1.33. Although transparent, chlorine has a greenish-yellow color and when in small quantity has an odor resembling seaweed. But when in large quantity its smell is extremely offensive and suffocating and is unlike that of any other known substance. As to weight, it exceeeds that of ordinary air about two and a half times.[1]

Now the relation between bodies which we call chemical produces such profound influence upon the bodies concerned that often, indeed usually, not a single one of their original attributes remains after the interaction is complete. The individuality of each entirely disappears. Or, otherwise stated, so far as concerns the portions of the bodies actually participating in the reaction, and so far as concerns our original knowledge of them, both are gone absolutely—are destroyed—by their action upon each other, and in place of them a third body, common table salt in the example chosen, wholly different as to identifying attributes from either of the originals, has come into existence. The identity of the interacting bodies is entirely lost instead of being only very slightly modified as in the case of the astronomically related bodies.

Nor can we, consistently, even with a purpose so non-chemical as this examination, neglect to notice one feature about the new body,

[1] The partial inventory of the attributes of these two bodies is taken essentially from the *Treatise on Chemistry* by Roscoe and Schorlemmer. I must avail myself of this opportunity for calling attention to what, from the standpoint of the mental technique of natural knowledge, is a rather serious defect in many text books of chemistry. This is in the failure of their authors to put down, explicitly, at the beginning of the treatment of each chemical substance, enough of its defining attributes to establish firmly in the student's mind an irreducible minimum of the foundation of all our knowledge of the substances. To the experiences of a working chemist it seems quite useless to hark back constantly to the elementary description of the substances with which he deals, so little do many of the attributes enter as such into his operations and calculations. But once one recognizes fully the tendency of the human mind to wander off into unsubstantial abstraction, and sees the dire consequences which such wanderings have had in the history of human knowledge, he will be duly impressed with the importance of so grounding the neophytes of science in the indispensables of observational knowledge that they shall never become the victims of speculation, the objective foundations of which have been torn out and cast aside.

I am quite of the opinion that even the ordained priests of science sometimes substitute the bodiless creations of their own minds for the stones of nature at critical places in the temples they build.

table salt (sodium chloride), which has been produced by the interaction between the old bodies, the sodium and the chlorine; the new body differs from both the old ones in such a way as to make it quite impossible to tell which, if either, of the originals, was the cause of the attributes of the new body. For instance, is the pure white of the salt caused by the yellowish-green of the chlorine; or by the "peculiar purple" of the sodium vapor; or by both operating together; or by neither of these, but by something else about either sodium or chlorine or both? Again, is the particular crystal form of the salt, belonging to the regular or cubic system, caused by the crystal form of the sodium, this being said to crystallize in the very different octohedral form belonging to the quadratic system? To the practical chemist questions of this sort are likely to be taken as indicating an ignorance of modern chemical ideas that is worse than puerile because being a show of knowledge that is mere pretense. No tyro in chemistry now imagines, he may say, that the properties of chemical compounds arise in any such way as is here implied. It is all a matter of molecules, atoms, electrons, *etc.*, we are told, the sensible, superficial attributes being in no wise causally concerned. But here is where the cogency of our questioning comes in. If we are really going to stand for the validity of observational knowledge—that is, are going to adhere to the principle that but for a substratum of such knowledge we could have no knowledge about any thing—then we are bound to recognize that no matter what order of constituents of the substances with which we deal, their sensible qualities, observed or unobserved, are what we must depend upon for anything intelligible we can possibly say about either chemical simples or chemical compounds, as to structure and function, or as to cause and effect. Consequently, so long as we are in almost total darkness concerning the details of how sensible qualities of constituent simples are related to sensible qualities of compounds, the only thing we can say, speaking of causes, is that the sensible qualities of the reacting simples *taken altogether,* somehow produce the sensible qualities of their derivative compound *taken altogether.* In the all but total absence of detailed observational knowledge of the causal factors in the transformations which characterize that relational influence known as chemical, we are obliged to be satisfied to describe the process and the results in *general,* or *mass, terms.* We are certain that an observed and measured quantity of chlorine taken in its entirety, and an observed and measured quantity of sodium also taken in its entirety, by acting upon each other under proper conditions, always produce an observable and equal quantity of "table salt." But there certainty as to causal details ends. Consequently, in so far as chem-

ists set aside the language of these observable facts and substitute therefor the language of the supposed molecular, atomic, and electronic processes involved, they are really setting aside an extremely important portion of certain knowledge and substituting for it uncertain, or speculative, knowledge.

The central point in these reflections for our purpose is that the only region of certainty in which we can move when dealing with relations of the sort known as chemical, is really a region of *wholes* much more than of the constitutent parts of these wholes, exactly as was the case when dealing with gravitational relation. So far as the present state of science enables us to go, the only thing we are certain of as to the origin of the attributes of bodies produced chemically is that they result from the *combined action* of the attributes of the original or parent bodies.

Returning now to our quest for a criterion of relational influence in the living world, see what we have done toward setting limits of such influence generally. At one extreme (gravitational interaction) we have observed that although the influence of the relation on each of the bodies is profoundly determinative in certain respects, still the individuality and identifiability of the bodies are unimpaired.

At the other extreme (that of chemical interaction) the individuality and identity of the bodies are, on the contrary, wholly lost, the bodies having to all appearances completely funded or pooled their attributes in a new body.

But since natural science has now progressed so far as to be able to affirm with great positiveness that living beings are as truly subject as are not-living beings to the relational influences at both these extremes, it is justifiable to use the principles involved in the phenomena at these two extremes in formulating a criterion of relational influence that is not only organic but developmentally organic.

Taking due cognizance, now, of the unequivocal fact that every body known to us which either at this time is, or at any past time has been, truly living, has both undergone many and profound changes (growing, developing and adult functioning) and has maintained its individuality and identity, we are able to give a definition of organic relational influence so broad that it can be used in any examination of such influence as we may undertake, no matter into how much detail we may wish to go. Or, recalling our perception of the need for some such word as conferentiation with which to designate the general idea of such influence, we can now give a definition of the new word that will serve as the criterion we are after: *Conferentiation is that process in the living world which is the creative antithesis*

of differentiation. It consists fundamentally in the establishment of a relation among living bodies and parts of these such that while the bodies and parts maintain their individuality and identity, they undergo some measure of change. It is that relational action in living bodies which, while producing determinative changes in the bodies, at the same time leaves the individuality of these not only identifiable and unimpaired, but even improved relative to their former states.

This conception firmly grasped may serve as a touchstone, so it seems to me, for testing an enormous range of phenomena of living nature. Not only the whole sweep of purely physical structure and function (the provinces of morphology and physiology), but the great and vastly more vital and appealing realm of human life in its higher reaches (the provinces of psychology, sociology, politics, esthetics, religion, and the rest), can be illuminated by conscientiously applying the criterion. What results from such application in morphology and physiology is exhibited in some detail in Part II, *The Constructive Side of the Organismal Conception* of my book, *The Unity of the Organism.* Systematic application of the criterion lies beyond the purpose of this article. A few illustrations do, however, seem desirable. I shall give three, selecting them from widely separated provinces of the realm of life. These selections will appertain to the relation between parts in the *individual* of higher organisms, to the relation between individuals in the *primary organic groupings of higher organisms,* and to the relation between groups of individuals in *advanced societies* of the human species.

(*To be continued*)

WILLIAM E. RITTER.

LA JOLLA, CALIFORNIA.

DR. RUML'S CRITICISM OF MENTAL TEST METHODS

IN a recent discussion of "the need for an examination of certain hypotheses of mental tests,"[1] Dr. Beardsley Ruml characterizes the results of mental tests as "astonishingly meager in theoretical value," laments the "unproductiveness of the field in propositions of fundamental significance," and criticizes investigators for their failure to find "generalizations of interpretative value in their own material."

This "fruitlessness of the mental test field" and the consequent "waste of scientific talent" is attributed to the persistence of habits of thinking about intelligence which are founded "not upon mani-

[1] This JOURNAL, Vol. XVII, pp. 57–61.

festations of intelligence as we commonly experience them, but upon derivative facts which are the results of measurement by mental tests." "These derivative facts," Dr. Ruml states, "are subject to fundamental bias due to the nature of the terms in which the results of mental test performance have been expressed, and due to the type analysis which our limited and frequently misused statistical technique makes possible." In particular the author specifies as questionable three assumptions into which investigators have been led by a misuse of the derivative facts afforded by mental tests: (1) The assumption that general intelligence can be expressed as a linear or one-dimensional function; (2) the assumption of rectilinear regressions between test performance and general intelligence; and (3) the assumption of a static intelligence level that "does not vary from time to time or from place to place."

1. As to the linearity of general intelligence, it may be questioned whether any one has assumed linearity in the sense in which Dr. Ruml seems to use the term; *i.e.*, in the sense that all intellectual processes are fundamentally of one kind, or in the sense that the intellectual differences among people are adequately expressed simply in terms of more or less of this one hypothetical unitary trait.

No one will dispute Dr. Ruml's statement that Henry may be inferior to Henrietta in certain types of mental processes and superior to her in others, just as a tall man may be "larger" in the vertical dimension than a small man while at the same time "smaller" in the horizontal dimension. Of course we have no warrant for assuming *a priori* that the man who is larger in the vertical dimension *is* smaller in the horizontal. Quite the contrary, the most reasonable estimate would be one utilizing the positive correlation which exists between the two measurements. Dr. Ruml will admit that such estimates are better than random guesses, but of course a desirable procedure, when possible, is to take both measurements if both are needed in interpretation and if they are likely to differ widely. The hip height of a child is important in assigning seats, but if assignments are upon the basis of total height very little misplacement will result. We take no exception to Dr. Ruml's height-thickness illustration; it is simply a rather poor parallel to most mental situations, as the correlation between mental traits is more likely to resemble that between hip height and total height than that between height and thickness. Spearman could not have made out as good a case as he has for a "single mental function" if the usual correlation between mental traits were not high.

We would urge, along with the hundreds of others engaged in devising special mental tests, that various types of tests be used for

the measurement of various types of mental processes. We would also insist that after applying such tests we are justified in combining them into a single measure if that measure has richer interpretative value than the various measures taken separately. In appraising a mineral deposit, a mining engineer secures samples from various locations and builds up a single total estimate of the mine's value, expressed in terms of a linear dollar and cent scale, even though many different ores may be involved. For certain purposes, such as the buying of machinery, the detailed analysis is necessary. Concepts of aggregates do not preclude recognition of detail.

The Binet scale, for example, not only recognizes the qualitative differences of intelligence at the various levels, but is especially designed to bring into relief what Binet called the hierarchical nature of diverse intelligences.[2] These "diverse intelligences" range from sensorial intelligence up through perceptual intelligence and representative intelligence to abstract intelligence and judgment. While it is true that in one sense the Binet scale is not a linear measure, it does serve to indicate an individual's position with reference to this hierarchy, and the mental age scores which indicate such positions constitute a scale which, in a special sense, may be regarded as linear.

2. As to the second assumption which Dr. Ruml criticizes, the assumption of rectilinear regressions between intelligence and test performance, it is more nearly in accord with the facts to say that rectilinear regressions have been *found* than to say that they have been *assumed*. Certainly anything else than a reasonably rectilinear regression in mental tests is extraordinarily rare. For example, not a single regression sufficiently non-rectilinear to permit determination of its type was found by one of the authors (Dr. Kelley) in an extended treatment of the results of 22 different serial tests which were tried out with several groups of children and various kinds of criteria in connection with work on the National Intelligence Scale. Dr. Ruml has probably been influenced in his point of view by finding non-rectilinear relationships in trade testing. The building up of a technique for handling problems of this sort merely awaits the need for such. Dr. Ruml has a procedure which he has used for this purpose; one of the writers of this article is shortly to publish another, Charlier has another, and Pearson has several. The non-rectilinear relationships of trade test data are so easily accounted for upon the basis of the acquirement of very specific habits and trade information that they constitute no criticism of the assumption of rectilinearity in the general intelligence field. It is a mere question

[2] See especially *L'Année Psychologique*, 1905, Vol. 11, pp. 194–195.

of fact whether such relationships are common. Surely, with all the scatter diagrams which have been published by intelligence test investigators in the last ten years, it devolves upon the critic to point to specific situations where material error in conclusion has resulted from the assumption of rectilinearity. The writers do not doubt that there are such, but the really astonishing fact is that they are so few. We of course would urge along with Dr. Ruml that tests for rectilinearity be more commonly resorted to.

3. To the third assumption, that the intelligence level is static, Dr. Ruml opposes the dogmatic assertion that "we know our general mental adaptability to new problems" varies markedly from time to time and from place to place. Perhaps Dr. Ruml "knows" this by intuition, and if so his position can not be questioned by argument. Or has he simply replaced one assumption by another more gratuitous?

In regard to the more fundamental aspect of the entire problem, we would call attention to the fact that the ultimate value of an hypothesis does not depend upon its absolute correctness. On the contrary, some of the most fruitful hypotheses ever given to science have later been shown to be only approximations. Newton formulated a mathematical statement to express the space and force relationships between two masses. The statement has, however, been more than merely interpretative of the specific phenomena in connection with which it was first formulated. It has been tried in new fields—inter-stellar and inter-molecular masses and distances. It has been applied to a sub-molecular matter the very existence of which could not have been apprehended by Newton. What if Newton's laws have broken down? What if Einstein shows that they are only approximations? The service to science has been rendered. Newton's laws were "generalizations of interpretative value in their own material." They were closer approximations to an exact statement than the concepts which they displaced, and in turn will be displaced only by a still closer approximation. Surely Einstein would not claim to have an exact formulation. The Einsteinian, and earlier the Newtonian, statements are mere points of departure. Without Newton as a base there could be no Einsteinian refinement.

This is exactly the situation that obtains in the mental measurement field. The relatively simple and admittedly much less important concept of "constancy of the I Q" may be taken as an example. Future investigation will probably show that this formulation does not rigidly hold, but as a point of departure it has been and still is of great service. Undeniably it will be of value to know

that relatively a child develops mentally more rapidly at certain times and in certain functions than others. But relative to what? Why, of course, relative to that mental feature which is the most stable and characteristic which can be found; with our present state of knowledge, relative to the I Q. The concept of the I Q will not fall as a result of mere verbal attacks, but only when it is experimentally shown not only that it is inconstant, but how it varies. This time will probably come as a result of the work of the very people who have built up the concept. The physicists of to-day are not the ones who object to modifying Newtonian concepts, nor are those most deeply devoted to mental measurement averse to modifying any of the interpretative concepts of the movement. Such concepts as "the constancy of the I Q," "a practical limit to general mental development somewhere in the neighborhood of age 16," "the bearing of mentality upon delinquency and insanity," "the general linear (usually rectilinear) positive correlation between desirable traits," "the great relative importance of individual differences in determining our success in meeting life tasks," "the importance of the intelligence level in fields far removed from the scholastic, as in army assignments," are to be refined, not discarded.

Dr. Ruml seems to advocate a philosophical approach beginning with a definition of terms. We would not withhold encouragement to philosophers who define and thereby help perpetuate valuable concepts, but definition is not the essential genius which leads to discovery. If an experimental procedure reveals that a certain thing is true with reference to a first individual, a second, a third, and many others; if it exists as a phenomenon of human nature and can be measured, then it is entitled to a name and a definition in terms of its experimental setting no matter if it cuts athwart long established concepts.

Dr. Ruml objects to a static intelligence level that does not vary from time to time and place to place. We will not stickle over the term "intelligence level," but assuredly if there is any mental trait which does not vary from time to time and place to place, that is the one of all which it is desirable to know, to measure and to analyze. Life itself, individual, social, biological, physical, may be but a series of divergences from certain constants, but whether this characterizes all of life or not the concept is a most fruitful approach to the scientific understanding of social, biological, and physical relationships. These divergences can only be understood by reference to the constants from which they vary. The zoologist does not measure the belly-band of the blow-toad; he looks for certain skeletal relationships which have scarcely varied in ages. The economist does not

base his view upon the gyrations of a "war-bride"; he goes to great trouble to obtain an index number which is a measure of a more or less constant condition or of a gradual trend. The mental examiner is dealing with the most variable aspect of human nature and it is to be expected that the future mile-stones of progress will be, as those in the past have been, the discovery of traits, capacities, interests, needs or tendencies of an individual which are definitive of him from day to day and place to place.

Thus far Dr. Ruml's criticisms, whether or not one accepts them as valid, at least raise definite issues of a kind which are worthy of critical examination. However, when the author abandons himself to sweeping generalizations regarding the "astonishingly meager value of mental test results," the "great waste of scientific talent," etc., he takes a position we regard as absurdly hypercritical and not demanding an answer.

The history of science shows that direct attacks unhampered by over much or too detailed data upon theoretical problems are usually confined to the early stages of the development of a particular science. In psychology, for example, Aristotle concerned himself with the nature of the soul, psychogenesis, soul biology, and the analysis of temperament; Plato with free will, the seat of the soul, and the soul's origin, nature and destiny; Descartes with the relation between soul and body; Hume, Berkeley and Kant with the origin of ideas and the limits of their validity; Leibnitz with soul energistics; Herbart with mental dynamics and the dethronement of the ego in favor of apperceiving and apperceived ideas; Lotze with the origin and unity of the soul and with the relation between mind and body; Fechner with the search for a mathematical expression of mind-body relationship and with a modified form of soul biology. Gradually as such problems are perceived to be, for the time being, insoluble, among other reasons because of the lack of data, effort is shifted in favor of concentrated attacks upon more immediate problems which serve a purpose in themselves and which may or may not provide a background for further theoretical advance. At this stage the larger issues may even seem to have been lost sight of altogether. A truer statement would be that the young science is girding itself for a new advance. In this connection it is interesting to contrast the methods of Aristotle, Galen, La Mark, Spencer, or Romanes with the minute and painstaking researches of the modern experimental zoologist, physiologist, or comparative psychologist. The infinitesimal minutiæ of truth resulting from a typical present-day research would surely seem trivial to an Aristotle, who, in an age when there was no science, did not hesitate to sketch the outlines of

half a dozen sciences. In short, if one loses sight of the essential facts in the historical development of science one is always in danger of demanding that the scientist attempt final explanations of phenomena which available knowledge is not competent to explain.

As Dr. Ruml does not define what he means by "theoretical psychology," "problems of fundamental significance," etc., it is impossible to say in how far he has neglected this aspect of the problem. If by theoretical psychology he refers to problems of fundamental importance to the science of psychology, then the charge that mental testing has been futile may be emphatically denied. A science of human mind can not regard as trivial such problems as individual and racial differences in mental ability, the relationships of mental traits, the phenomena of mental growth, the limitations of educability, or the psychology of genius, mental deficiency and insanity. On all these problems mental tests have thrown light, in some cases more than the entire previous history of psychology. Indeed the mental test method, using the word "test" in the broad sense, has become the most important method of experimental psychology. It is proving itself applicable not only to the problems of intelligence, but also to those of emotion, volition, character, and temperament. It is indispensable in the study of habit formation, mental fatigue, mental inheritance, and animal behavior, while in psychopathology it promises soon to overshadow all other methods. Yet the movement is still in its early infancy.

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REVIEWS AND ABSTRACTS OF LITERATURE

Instinct and the Unconscious: A Contribution to a Biological Theory of the Psycho-neuroses: W. H. R. RIVERS. Cambridge University Press. 1920. Pp. vi+252.

Here is another effect in the field of psychology that is the result of the stimulus of the revolutionary theories of Freud. Rivers's book is an attempt to give to the Freudian theories a biological interpretation; namely, that every animal function is (or *was* in the animal's evolution) of some use. The theory of natural selection says that all parts of the animal developed through their utility. The effort called a "biological interpretation" on the part of some biologists to give an explanation of the use, past or present, of every function is opposed by others (chiefly Loeb and his followers) who maintain that many functions are and have been of no use to the animal. If we agree with the former, then Rivers

has given us a biological formulation of the mechanisms of the Freudian theory that should make them acceptable to scientists.

Rivers begins with a short mention of the immense number of psycho-neuroses the war produced. Freud is credited as the originator of a complete scheme as to their causations and mechanisms. While agreeing in the main with the mechanisms, he says that "in the vast majority of the cases that occurred in war times there is no reason to suppose that factors derived from the sexual life played any essential part in causation but that these disorders became explicable as the result of disturbance of . . . the instinct of self preservation."

However, in speaking of hysteria in civil practise, Rivers says (page 135) that "according to my view hysteria as we know it through the effects of warfare is primarily due to the activity of the danger instinct. . . . My own experience of hysteria in civil practice is too small to enable me to deal adequately with this problem." And "There can be little doubt that factors connected with sex take a most important part in the ætiology of this state." Further, on page 120 Rivers says: "The differences between the neuroses of war and those of civil life are due in large measure to differences in the nature of the instinctive tendencies which have escaped from control. The relative simplicity of the war neuroses is due to their origin in disturbance of the relatively simple instinct of self-preservation, while the great majority of the neuroses of civil practice depend on failure of balance between the less simple sexual instinct and the very complex social forces by which this instinct is normally controlled."

It is interesting to see that Rivers, who has had almost as much experience with men who have developed neuroses from exposure to danger as Freud has with those who developed them in civil life, applies the Freudian mechanism to the danger instinct as readily as Freud does to the sex instinct. The view so hotly held that Freud lays too much stress on sex as a causative factor is but partially supported. Sex is shown not to be the only or sole causative factor of the neuroses. On the other hand, and this is supremely important, it is shown that the Freudian mechanisms operate in the psycho-neuroses of war as well as peace.

Much as Freud's views on all matters are still bitterly attacked, so calm and candid an expert as Rivers does well to point out that the world owes Freud a huge debt, in that without his clues to the psycho-neurotic mechanisms the highly successful psycho-therapeutic results in the war might not have been obtained. Freud and those who agree wholly or in part with him have always felt that

there was and is much about the neuroses that still needs understanding.

The main purpose of the book is to "consider these mechanisms in their relation to the more normal processes of the animal organism and especially to the mechanism by which certain parts of experience become so separated that they are no longer capable of recall to consciousness," . . . "to consider the biological function of this process by which experience passes into the region of the unconscious," and "to show that the psycho-neurosis is the solution of a conflict between opposed and incompatible principles of mental activity." This calm assumption of "the unconscious," this recognition of a process whereby functions which were conscious become unconscious, upon whose importance Freud so strongly insisted, must be rather unpleasant to the school of Wundt and Dunlap.

Rivers next says "the term unconscious applies to experience . . . as is not capable of being brought into the field of consciousness by any of the ordinary processes of memory or association." This is Freud's conception of the term.

Repression is reserved for "the process by which we wittingly endeavor to banish experience from consciousness" while suppression which Rivers uses as the psycho-analysts use repression "occurs wholly without the intervention of volition." Repression in the Rivers sense is but one of the many ways in which suppression may and often does take place. There is good reason to believe that it takes place without conscious effort. "Suppression is a reaction to pleasures and pains which are immediately present and takes no account of the more extended experience with which it is the function of intelligence to deal." The phsiological research work of Head, Rivers and Sherren that resulted in the formulation of the afferent mechanisms of protopathic and epicritic sensibility is the source from which an understanding of suppression is derived.

Protopathic sensations only tell us that something is there and that it is pleasant or unpleasant, hot or cold, and that it is mere contact or pressure. Epicritic sensibility, probably a later phylogenetic development, is characterized by exact discrimination and localization. Protopathic sensibility is crude and the reactions it produces are sudden and of a mass type. Epicritic sensibility is complex and delicate and may result in many forms of reaction depending upon the nature of the stimulating object. When they coexist they fuse and "certain aspects of the earlier forms of sensibility are modified to a greater or less extent and in some cases this modification involves disappearance of certain characters" and the result is normal cutaneous sensibility. The characters of

radiation and distant reference in protopathic sensibility become latent and can reappear only under appropriate conditions. This has been experimentally determined and it was possible for Rivers to actually produce suppression by the application of cold. "The experiment revealed a feature of primitive sensibility which had been so successfully suppressed that its existence had not been suspected until the beginning of the twentieth century." This is not quite fair to Freud since in his *Zur Geschichte der psychoanalytischen Bewegung* he says "The Theory of repression is one of the foundations upon which psychoanalysis rests" and he formulated 'repression" first in 1896 in his *Weitere Bemerkungen über die Abwehr-Neuropsychosen* which appeared in the Neurologisches Zentralblatt, 1896, No. 10.

Head, working in conjunction with Holmes, showed that there is a relation between the cortex and the optic thalamus that is analogous to that existing between protopathic and epicritic sensibility. The experimental proof for Freud's clinically derived conception of "repression" may eventually be derived from experiments in this field. Simply stated it is the mechanism of inhibition that in its evolution is called upon for an understanding of all these phenomena. It is the chief constituent of suppression. "Control or inhibition belongs to the essence of nervous activity" and it is suggested that "suppression by which experience becomes unconscious is only a special variety of the process of inhibition common to every phase of animal activity." He shows how at first it works on the "all-or-none" priciple, how it then becomes graded and throughout shows its results in function and structure. He makes inhibition of early tendencies a *corollary* of evolution. Primitive patterns of activity must be kept from going into action in favor of more discriminating ones. In pathological states the earlier forms are again used.

The content of the unconscious is made up of experiences, both emotional and intellectual, but the latter always connected with a strong affective tone in which emotions that interfere with comfort and happiness have been strongly roused. In addition there are large elements of more or less neutral experiences, such as the setting in which the pain was experienced, that are carried into the unconscious in the act of suppressing the painful experience. The unconscious is therefore the storehouse of experience associated with instinctive reactions.

In the chapter on the nature of instincts he contends that the behavior of animals is not as fixed and mechanical (reflex) as we had supposed, while man's is much more so. The difference between man and animals is one of degree and not of kind. The theoretical

differences between instinct and intelligence are easily made but the practical differences are more difficult to describe accurately.

It is possible to observe the most complicated behavior in insects and other animals that is wholly independent of individual experience. But in the case of the higher animals, including man, this is not so easily observed. In man it is very difficult to separate innate from acquired experience.

He then analyzes the nature of instincts. He leaves out of consideration the instincts of insects and invertebrates as being too different from those of man and the vertebrates. The behavior of adult man as compared to that of infants and animals is examined for criteria for his classification. One of the characteristics of the response of an infant or animal to danger is that it tends to be made with all its vigor and without discrimination. In certain cases this is also true of adult man. When man does this he may be said to act instinctively and acting thus, he shows an absence of gradation. To characterize these responses Rivers borrows a term from psychology "the all-or-none reaction" originally used by Keith Lucas and A. D. Adrian. Responses which are of the "all-or-none" type show: first, absence of exactness of discrimination, of appreciation and of graduation of response; second, they react to the stimulus with all their possible energy; third, the response is immediate and uncontrolled.

Head and Gordon Holmes have shown that all these characteristics are true in a large measure of optic thalamus activities. Rivers brilliantly suggests that these be viewed as the protopathic aspects analogous to peripheral protopathic sensibility and that they form the central basis of emotional reaction. This type of activity, although instinctive, is quite different from the highly patterned activity of insects which we also call instinctive although these may also be subject to the "all-or-none" principle. Rivers therefore proposes that instincts be classified as protopathic and epicritic. Protopathic instincts act on the "all-or-none" principle and are not capable of gradation. Epicritic instincts are discriminative and graded in their activity. The latter characterize the elaborate instincts of insects and certain forms of innate behavior in man. The former are especially obivious in some of the innate behavior of man and animals. To us it seems that when the response of an organism to a stimulus is so graded that it can be called epicritic it is highly integrated and when observed we call such behavior intelligent. If this be true we have just as much an instinct to be intelligent as we have an instinct to fight, fear, *etc.*

For the purpose of discussing the danger instincts Rivers now divides instincts in general into self-preservative, race-preservative

and social or herd instincts. The first is subdivided into "attractive" forms such as hunger and thirst and "repulsive" forms such as disgust.

From this point on there is the same attempt at division without any well marked lines of demarkation that marks the usual psychology of old whenever it leaves the biological method of approach. After the classification is set up the reactions to danger are connected with specific forms of emotion.

Rivers connects flight with fear, aggression with anger, manipulative activity with absence of affect. The absence of fear and pain in manipulative activity when the latter is a response to a danger stimulus is explained by their being suppressed. The complete suppression of fear and pain in the act of immobility is also suggested and the possibility that suppression was in its earliest forms brought about by the response of immobility to danger in the effort to suppress fear and pain (page 59).

Of course, Rivers's chief endeavor has been to show the suppression of affect in the organism's response to danger in such states as immobility in animals and manipulative activity in man. The latter is distinguished from the former in that there need be no loss of memory of the events that produced the reaction. That there may be complete loss of memory is well known and may be accounted for by the completeness of the suppression.

This completeness of suppression which he calls "all-or-none" is the form it takes in infants, children and animals. In adults it occurs in pathological states due to the process of regression which "steps down" activity to a pattern it acted upon in an earlier state. Suppression on the "all-or-none" principle must have come into existence very early in the evolution of animal life. The need for this complete kind of suppression of earlier or alternate modes of behavior Rivers illustrates by the life of the caterpillar that becomes a butterfly and the tadpole that becomes a frog. In both cases the persistence of the earlier form of activity would terminate the life of the fully developed animal.

In man there is not only suppression of tendencies and experiences but there is evidence that these lead a kind of independent existence which motivates and modifies behavior and is incapable of recall by ordinary processes of memory.

This independent existence of a suppressed experience is usually known as dissociation. When it returns to consciousness as multiple personality, Rivers, adopting Morton Prince's terminology, calls it "co-conscious," but in the case of a fugue he purposes to speak of "alternate consciousness." He also limits the term

"dissociation" to those activities that are accompanied by independent consciousness.

Rivers here makes a bold attempt to carry Elliot Smith's suggestion, *viz.* cerebral development was in part due to the stimulus of arboreal life on early man's activities, still further. Premising the evolutionary theory he draws a biological parallel between animals like frogs, newts, caterpillars on the one hand and man on the other and shows that the dissociation that is so necessary for lower animals gave way in man to an integration when he went from ground to an arboreal life and that this integration would account for the association tracts in the neopallium. In other words, the suppression of suppression by grading it so that two opposing modes of behavior become integrated. We humbly suggest that it is possible to speak of this as the instinct to suppose suppression or of an instinctive tendency to release and re-align opposing tendencies and is not this the process we call intelligence? Behold intelligence becomes instinctive!

One chapter (XI) is devoted to rescuing from common abuse the term "complex." He takes issue with Bernard Hart whose definition of complex is any "emotionally toned system of ideas." This is almost identical with the "sentiment" of orthodox psychologists. Rivers says "sentiments" are features of the mind which take part in the most finely graduated processes and are connected with discrimination of the most delicate description. The complex being the result of suppression always partakes in some degree of the "all-or-none" principle and in some degree is a pathological manifestation as opposed to "sentiment" which is a necessary and constant feature of normal mental life.

Chapter XII which takes up suggestion is the key to the book. Suggestion is used as "a comprehensive term for the whole process whereby one mind acts upon another unwittingly. From this point of view suggestion can be put side by side with suppression as one of the processes of instinct." Like suppression, Rivers says, it works unwittingly. The great source of suggestion is herd life and its greatest use is in protecting the herd from danger. Its need when the "instinct for immobility" is the necessary reaction to danger is obvious when absolute uniformity is essential to the welfare of the group. It is the "instinct which is concerned with collective as opposed to individual needs" but the herd acting upon the individual for the benefit of the former unwittingly modifies the individual's instinctive behavior. This process of modification Rivers calls suggestion. It is in fact the process by which instinctive behavior becomes modified (by inhibition?) and as such is used to explain sleep hypnotism, hysterical suppressions of sensibility, *etc.*

Instinct can act on the "all-or-none" principle only by virtue of suppression of every other pattern of behavior. Now instinct is in its turn suppressed by the herd acting through suggestion. Thus we see instinct becomes graded. The chapters on the psychoneuroses are excellent as far as they go. The biological analogies used make neuroses and psychoses more intelligible and coherent. They will stimulate further research by this method of approach.

The chapter on Sublimation is disappointing; it is barely more than two pages in length. Dr. Rivers must have seen a great deal of sublimation in his war work and I hope he will subject the data he has to a critical attitude as candid, general and searching as he has the process and end products of regression.

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Scientific Method: its Philosophy and Practice. F. W. WESTAWAY. Second edition. London: Blackie and Son. 1919.

This text is intended apparently to aid would-be teachers in England, particularly teachers of elementary science, by giving them a grasp of the elements of logic and scientific method. Any text on logic arouses again that long deferred hope, in those who are called upon to teach the first rudiments of logic, that here at last may be a way of approach which is both worthy of the subject and inspiring to the beginning student. The book before us does not satisfy that hope, which is, alas! Utopian, but in some respects it does go half way. It is a peculiar book. Written by a pragmatist, it is scornful of deductive logic; but displays, on the other hand, a most astonishing trust in the "authorities" of inductive logic, quoting them with a scrupulous respect which some of those quoted hardly deserve. One may say indeed, that the book is an orthodox and well-referenced elementary textbook on inductive logic, plus several peculiar preludes and supplements all its own. Thus, after a couple of preliminary chapters, good but brief, there is a chapter on philosophy's task and problem, distinctly the weakest spot in the book—in spite of having been rewritten for this edition—a chapter from which the average student would doubtless draw a considerable fund of confused misinformation. Then there follows something much better, a rapid history of philosophy from the Sophists to Hume, emphasis being on the logical contributions of the philosophers, a hundred pages pretty well done. This section might make the book useful to such students as would otherwise never learn anything of Plato or Descartes. Then follows the inductive logic, which covers the usual things well, and goes far enough to mention some points not ordi-

narily found in such detail, such, for instance, as the devising of empirical formulæ, and the reduction of observations. After the logic comes the most valuable section of all, "Famous Men of Science and their Methods," sixty pages, all too short, of quotations from scientists illustrating cases of actual inquiry, each case sufficiently at length to enter into the spirit of the thing. Admirable further references follow. Then comes a group of pedagogical suggestions concerning ways of teaching science, and the book closes with some final remarks commenting on the relation between science and the late war. Some teachers of elementary logic may find that this rather out of the ordinary sequence of subjects makes for them a useful introduction to philosophy through logic. In any case the book is worth looking over.

It may be that the perfect textbook on logic, like "the great American novel" so long awaited by critics, is a thing impossible, because what would satisfy some of the requirements would necessarily do violence to others. In the first place, it is doubtful whether there is any such subject as logic. There are a number of subjects called by that name, but they are about as different as chemistry and elocution. Logic lies on the vague boundary line where diverse empires meet and where there is great confusion of tongues. Our author, indeed, saves himself by calling his volume *Scientific Method.* But even so, full definiteness is not secured. There are great ranges of inquiry, at least approaching the scientific, inquiries in social sciences, in historical sciences, in applied sciences, in the arts, statesmanship, war, business, on which this book could scarcely touch, even had the author wished. And within the physical sciences themselves there is much that our author ignores, for this text is, as we have said above, orthodox. This is no condemnation of the book. It is simply a comment on logic texts in general, that they are, all of them, a random sample dipped up out of a larger world of facts. In the sample are strange beasts, large and small, and quite a bit of amorphous mud off the ocean bottom, the whole contents of the dipper being fairly well dried out before being shown to the student. So here is the first difficulty with logic texts, to locate their proper subject-matter. Any choice among brands of logic, including the one made below in the present article, is arbitrary and in a sense unfair.

In the second place, logic undoubtedly enjoys such favor as it has had in college curricula, because of the popular supposition, or shall we say superstition, that it is a practical subject. This might at first promise to be an aid in the choice of topics. Actually it complicates matters. It is possible that everyone might agree on a pre-

liminary pointing out of some of the crudely obvious fallacies, mostly matters of language or of intruding prejudice and emotion. But after that, what? If we are sincere in wanting to furnish something practical, we must never impose upon the student of logic any form of rules of the game which he would thereafter think of as being somehow peculiar to logic books, or which he could not subsequently apply, as it were instinctively, in his own daily thinking. This is a hard requirement. It condemns the syllogism as ordinarily taught. But also it opposes the strongest momentary desire of the student himself. He asks of his teacher in logic: "Give me a rule, that I may apply it automatically. I must pass the course, and don't you see how helpless I am when asked to think out the why of these things for myself?" But even if these difficulties be resolutely met, it is by no means evident that a programme of isolated problems can be other than both irksome and futile. It laboriously corrects now this fault, now that, but the power to apply in new cases is seldom thereby created. To accomplish that, we must create a spirit and an attitude, and above all, an enthusiasm, the feeling that there is something important at stake. The average student thinks crudely, but he is not worried by this, for he does not take his own thinking seriously. Here indeed is the key to the matter. The most practical instruction in logic is one that shall first establish in the student a respect for thought, a sense of its seriousness, an appreciation of its importance. And that in turn can only be accomplished by showing him thought at its highest power, playing the noblest part it is capable of in the great world of civilized life, showing it grappling with momentous questions, showing it solving problems important to all mankind. Teach thought in its great successes, and not in its correction of trivial and comic fallacies. Let the details of daily humdrum applications be added later, and in their proper proportions. Doubtless it is well that students should be taught to interpret sentences, to perceive what a question means or what it would be to deny a given statement. It is well that the student should gain skill in debate. We might even hope that somewhere he should obtain, what Mr. Westaway and some other eminent pragmatists have never achieved, some appreciation of what is meant by "logical form" and by deductive rigor. But all these, even if they belong not, as the case may be, to courses on rhetoric or on mathematics, must wait on the primary task of making a student feel, what he so seldom is made to feel, that thinking and right thinking really matter in the world of great affairs.

The ideal logic text must, then, introduce the student to thought at its highest tension and in its natural environment. Only great ex-

amples adequately and livingly presented will suffice. The ideal text would have philosophic breadth; the text before us has only miscellaneousness. The ideal text would have a center, a unity: for instance, it might treat of evidence in all the protean forms that evidence takes, what evidence means in a court of law, in a scientific laboratory, in an historical synthesis and reconstruction of a vanished civilization, in planning the route of a profitable railroad, in solving the secret of a crime, or facing the world problems of philosophy and religion. But the principle involved is ever the same: arousing an appreciation of, and admiration for thought, by showing it engaged in great and difficult works. We have no such text, nor an approach to such. For occasional lectures, the teacher of logic may even now draw inspiration from Merz's masterly volumes on nineteenth century science, or from such biographical works as Duclaux's *Pasteur: the History of a Mind,* or again, in a different quarter, from Cardinal Newman's *Grammar of Assent.* He may dip into Mach or Poincaré, or into the writers on historical methods. He may collect apt illustrations from many sources: from Wigmore's *Principles of Judicial Proof,* or from Gregory's *Discovery,* or indeed, from the text now before us. But all this is makeshift. We ought to have a text to put into the student's own hands, saying: "Read this and know that he who does not understand what thinking really means does not understand what civilization is. As correctness of speech is a prerequisite of eloquent speech, but mastery of language is more than correctness, so likewise, is it necessary that we think correctly—that is the indispensable though difficult minimum —but thinking at its best is more than correct, it is efficient and judicious and wise. It is the supreme prerogative of civilized man." Scarcely anything that has been done in the last fifty or sixty years has been incorporated in the existent texts of logic. Their authors seem to know neither the advances of symbolic logic, nor of instrumental logic, nor of science in general. But if we had instead such an ideal text as suggested, we should no longer have to apologize to our students and to ourselves for our courses in logic.

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JOURNALS AND NEW BOOKS

SCIENTIA, April, 1921. *Les contributions des différents peuples au développment des mathématiques. II. Le caractére international de la pensée mathématique* (pp. 253–262): Gino Loria (Genoa). – All suggested criteria of national style or method in

mathematics encounter exceptions, while wide variation appears within a single nation. The same discovery is not infrequently made simultaneously in different nations; different nations collaborate in developing a single field, or take up the same line of study in relays. *Paleontology: Its Contributions to Knowledge* (pp. 263–274): EDWARD W. BERRY (Baltimore).—Paleontology is the biology of the past and something more, for it reconstructs the environments of the past—a reversed ecology. For biology, it fills in the gaps of living species. It furnishes the most adequate chronology for the geologist, as well as tracing the ancient pathways of distribution and the shape of vanished continents. It can not explain the causes of evolution, but to it belongs "the actual procession of the myriad forms across the stage of the past." *Anaphylaxie et finalité* (pp. 275–280): CHARLES RICHET (Paris).—Anaphylaxia, the reverse of mithridatism, is the increased susceptibility to certain colloidal poisons, due to a previous non-lethal dose. This seems to be a purely harmful property of living organisms. The author suggests, however, that it is conducive to the stability of the species, and so has a sort of final cause. *La crise irlandaise* (pp. 281–300): J. VENDRYES (Paris).—The present Irish conflict is a psychological clash of two racial temperaments, exasperated by a long history of previous conflict. The author denies that religious differences are central. He sees beyond the perplexed and dark immediate future a more remote future, wherein Ireland, treated as an equal by the English, will prove itself more English at heart than seems conceivable today. *Reviews of Scientific Books and Periodicals.*

Keynes, John Maynard. A Treatise on Probability. London: Macmillan & Co. 1921. Pp. 466. 18 s.

Nussbaum, Robert. Nos fils, seront-ils enfin des Hommes? Notes d'un educateur spiritualiste. Paris: Félix Alcan. 1921. Pp. 115. 4 fr.

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NOTES AND NEWS

Dr. Robert H. Lowie, who has been for a number of years associate curator in the department of anthropology of the American Museum of Natural History, has accepted the position of associate professor of anthropology at the University of California.